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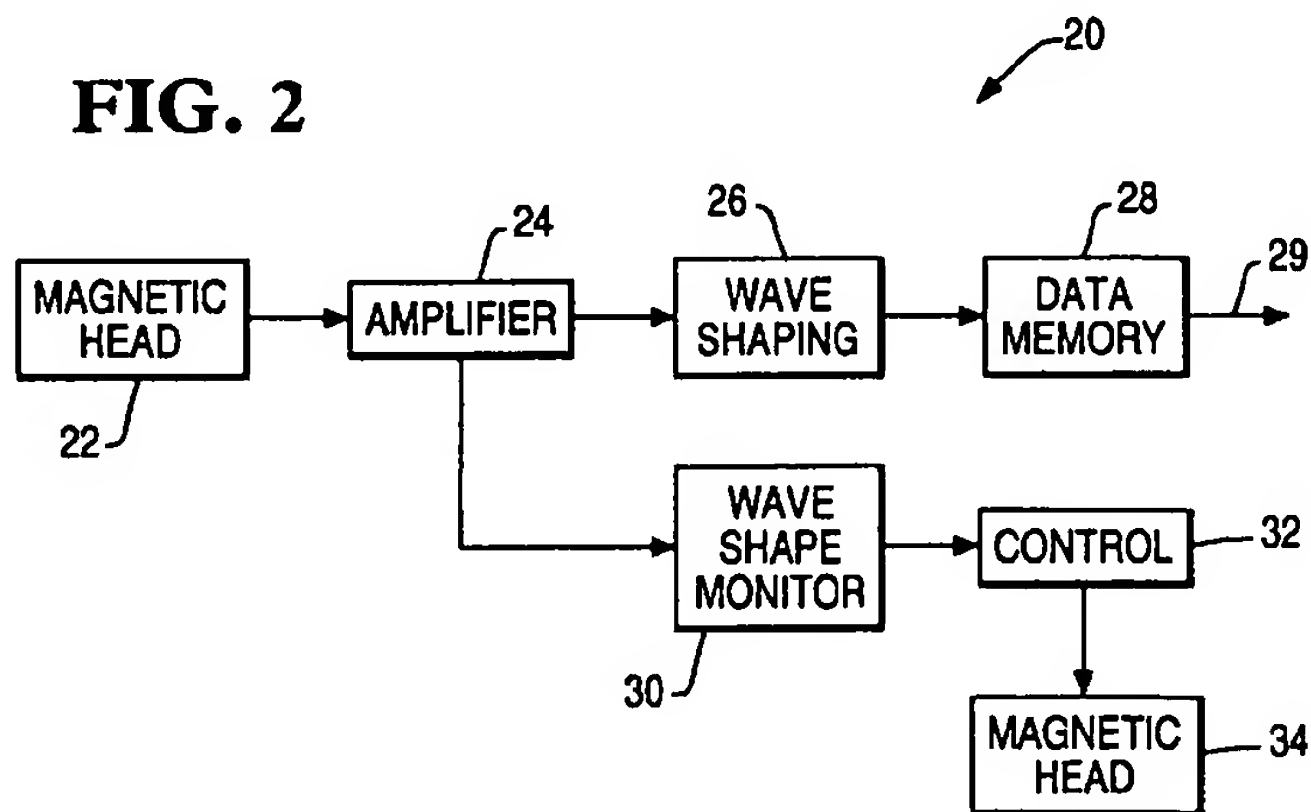
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(54) **Magnetic card reader**

(57) A reader (20) for a magnetic card for an automated teller machine (40) or other self-service financial terminal comprises a magnetic reading head (22), a wave shaper (26), and a data memory (28) to supply card-related data to a central authorisation position. A wave shape monitor (30) is preset with a threshold

amplitude, and detects the amplitude of analogue signals from the wave shaper; if the signals are readable but below the threshold level, the same magnetic reading head (22) or a different magnetic head (34) is instructed to rewrite the magnetic data on the card.

FIG. 2



Description

The invention relates to a magnetic card reader operated by a card carrying magnetic data. Such data may be authorisation data, e.g. for use with a self-service financial terminal such as an automated teller machine (ATM), or may be data on a magnetic stripe 'Smart Card' or electronic purse.

An advantage of such a card is the ease with which magnetic data can be written to the card, usually in a magnetic stripe, but unfortunately the converse is also true, and the data is easy to erase. Such an erasure can occur when the card is placed in close proximity to the magnetic clasp frequently used on handbags and pocket books. The damage may initially be slight, so that the card remains usable, but repeated exposure may cause cumulative damage and eventually the magnetic data will be unreadable. The card will then have to be replaced.

It is an object of the invention to provide a card reader for a magnetic data card which reduces the number of cards which have to be replaced due to cumulative erasure damage.

According to the invention there is provided a magnetic card reader comprising means to receive card having magnetically - stored data; magnetic reading means; and means to provide an output signal; characterized by monitoring means to monitor the quality of magnetic data read by the magnetic reading means, and magnetic writing means arranged to rewrite any readable magnetic data which is below a predetermined quality.

Also according to the invention a self-service terminal comprising processor means, card input means; magnetic reading means; data input means, display means; output means; and connection means for connection to a central authorisation means, characterized by a magnetic card reader adjacent the card input means, the reader comprising monitoring means to monitor the quality of magnetic data recorded by the magnetic reading means; and magnetic writing means arranged to rewrite any readable magnetic data which is below a predetermined quality.

Further according to the invention a method of operating a self service terminal comprising receiving a card having magnetic data stored thereon; reading the magnetic data on the card; determining the quality of the magnetic data; and rewriting any magnetic data which falls below a predetermined quality.

In the accompanying drawings, a known arrangement for a magnetic card reader is shown in Figure 1; the invention described by way of example only with reference to:-

Figure 2, which illustrates the arrangement of the inventive card reader;

Figure 3, which illustrates an alternative to the arrangement in Figure 2;

Figure 4, which illustrates an ATM incorporating a card reader according to the invention; and

Figure 5, which illustrates a control system for the ATM of Figure 3.

In the prior art system of Figure 1, a known card reader 10 comprises a magnetic head 12, an amplifier 14, a wave shaping device 16, and a data memory 18 having an output 19 connected, for example, to an ATM central authorisation system (not shown). In operation, a card having a magnetic stripe is placed in the reading head of an ATM so as to be adjacent the magnetic head 12. Magnetic data in the stripe on the card is read by the head 12, and an analogue electrical signal is supplied to the amplifier 14 which passes an amplified signal to the wave shaping device 16. The wave shaping device 16 supplies a digitised version of the analogue signal to the data memory 18, which stores it; the stored version is the equivalent of the data stored magnetically in the card.

The signal on the output 19 of the data memory 18 may for example be passed to the central authorisation system of an ATM, the signal indicating the identity of the cardholder. The authorisation system then provides a return signal authorising the cardholder to perform a transaction on the ATM, such as a cash withdrawal.

Clearly, if the magnetic data on the card has been damaged, the signal on the output 19 of the data memory 18 will be inadequate to allow authorisation of use of the card.

Figure 2 illustrates a similar system of a card reader 20 having a magnetic head 22, amplifier 24, wave shaping device 26 and data memory 28 having an output 29. In addition, there is provided a wave shape monitor 30 connected to the wave shaping device 26, and a control device 32 connected to a further magnetic head 34, arranged to operate in a magnetic write mode.

Operation is similar to that of the card reader 10, but in addition the amplifier 24 provides an analogue signal to the wave shape monitor 30. The monitor 30 contains a preset threshold level; if the amplitude variation of the analogue signal from the wave shaping device 26 falls below the threshold, the monitor 30 provides a signal to the control 32, which operates the magnetic head 34 to rewrite the magnetic data in the stripe on the card.

In a variation, not shown, the further magnetic head 34 is omitted, and the control 32 is connected to the magnetic head 22, instructing it to operate in a magnetic-write mode to rewrite the data on the card.

In Figure 3, a further variation is shown in which a card reader 20 has a magnetic head 22, an amplifier 24, a data memory 28 and a control device 32 to control a magnetic write operation. In the variation, the wave shaping and monitoring are performed in a single digital signal processor 60, which provides an output 62 consisting of corrected magnetic data, which is supplied to the control device 32 to rewrite the magnetic data on the

card stripe as before.

The wave shape monitor 30 can be a hardware or a software system. The threshold, i.e. the predetermined level of quality, is preferably capable of being reset or otherwise under the control of the authority operating the card reader.

It will be understood that the rewriting of the data on the card is only possible if the data is initially readable, but damaged so that it falls below a required quality. If the data is so badly damaged that it cannot be read by the magnetic head, then no rewriting occurs. In the operation of the invention, it is always initially - present data which is rewritten, there is no facility to modify or update the data.

Figure 4 shows an ATM 40 having a magnetic card input slot 42, a display screen 44, a keypad 46, and a cash delivery slot 48.

The control system for the ATM 44 is shown in Figure 5, in which a processor 50 is connected to receive input from the keypad 46, to control the display 44, and to control a cash counting and delivery system 52 connected to the cash delivery slot 48. A card reader 20 according to the invention is also connected to the processor 50. The processor is connected by a connection 54 to the central authorisation system of the financial institution operating the ATM 40.

If a cardholder inserts into the slot 42 a card which contains readable but damaged magnetic data, the card reader according to the invention operates as described above to rewrite the data on the card while the ATM transaction is in operation.

A card reader according to the invention can be incorporated in other types of self-service financial transaction terminal for which card authorisation is required, for example a balance - enquiry terminal.

A card reader according to the invention can rewrite damaged magnetic data with sufficient accuracy and amplitude to meet current international standards, so that cards damaged by accidental exposure to a magnetic influence, but still readable, need not be replaced.

Claims

1. A magnetic card reader comprising means to receive a card having magnetically - stored data; magnetic reading means (12 or 22), and means (14,16,18) to provide an output signal, characterized by monitoring means (30 or 60) to monitor the quality of magnetic data read by the magnetic reading means (22), and magnetic writing means (34 or 22) arranged to rewrite any readable magnetic data which is below a predetermined quality.
2. A magnetic card reader according to claim 1, further comprising wave shaping means (26 or 60) which provides an electrical analogue signal related to the magnetically - stored data, characterized by wave shape monitoring means (30 or 60) arranged

to monitor the quality of said analogue signal.

3. A magnetic card reader according to claim 2, characterized in that the wave shape monitoring means (30 or 60) contains a predetermined amplitude level, and is arranged to compare the amplitude of the electrical analogue signal from the wave shaping means (26) with the predetermined amplitude level, and to cause the magnetic writing means (34) to rewrite the magnetic data if the amplitude of the analogue signal falls below the predetermined amplitude level.
4. A magnetic card reader according to any preceding claim, in which the magnetic writing means and the magnetic reading means comprise a single magnetic device (22).
5. A self-service terminal comprising processor means (50), card input means (42); magnetic reading means (22); data input means (46), display means (44); output means (52); and connection means (54) for connection to a central authorisation means, characterized by a magnetic card reader (20) adjacent the card input means (42), the reader (20) comprising monitoring means (30) to monitor the quality of magnetic data recorded by the magnetic reading means (22); and magnetic writing means (34) arranged to rewrite any readable magnetic data which is below a predetermined quality.
6. A method of operating a self service terminal comprising receiving a card having magnetic data stored thereon; reading the magnetic data on the card; determining the quality of the magnetic data; and rewriting any magnetic data which falls below a predetermined quality.

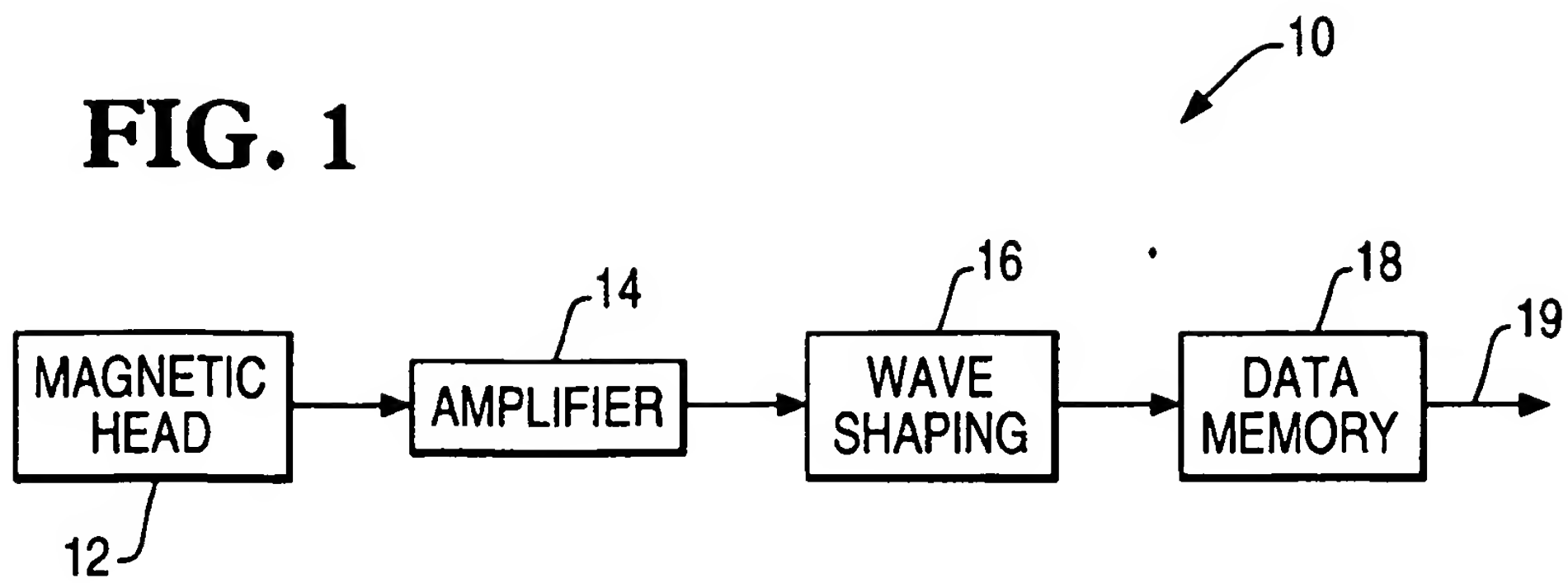
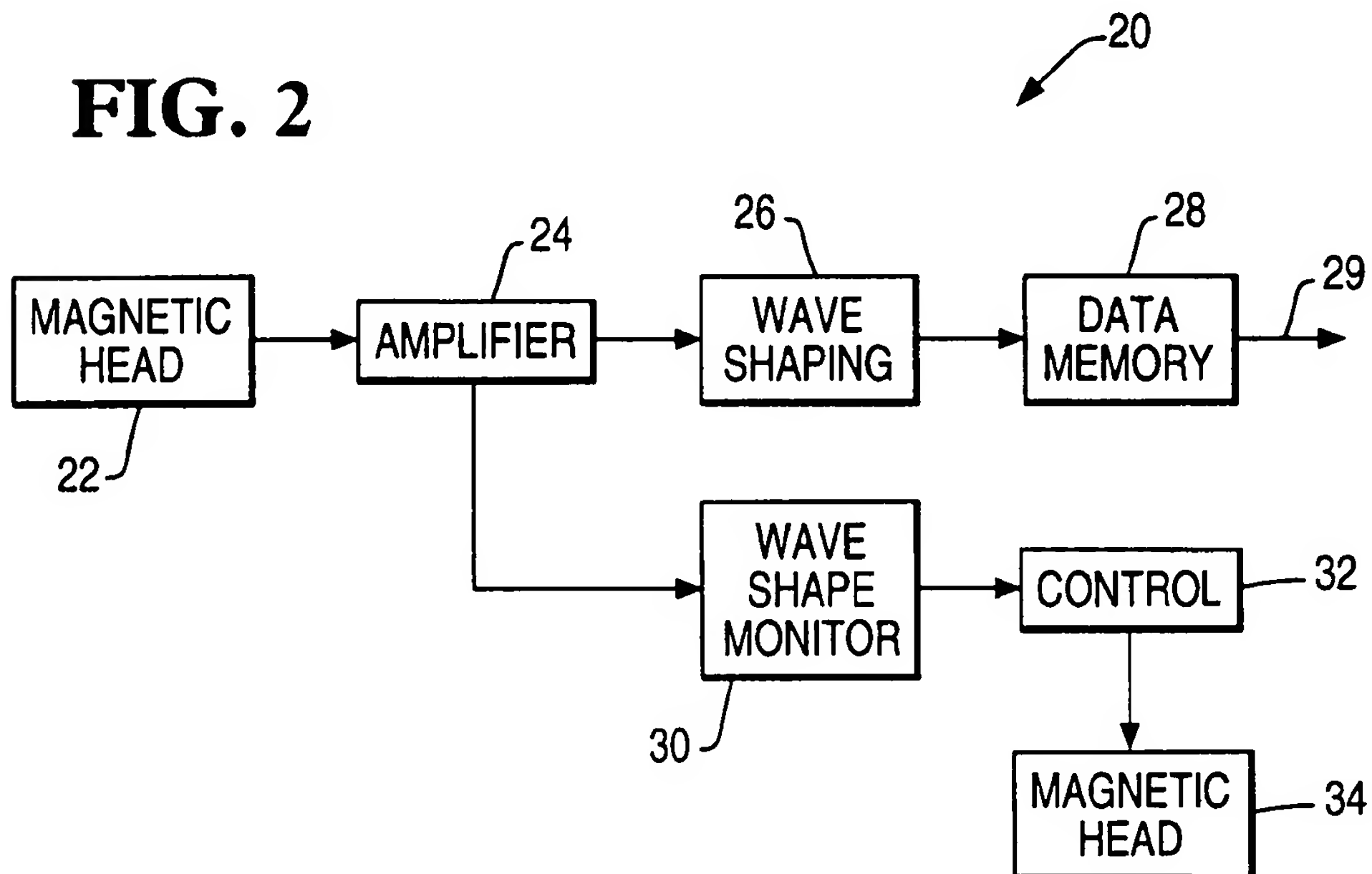
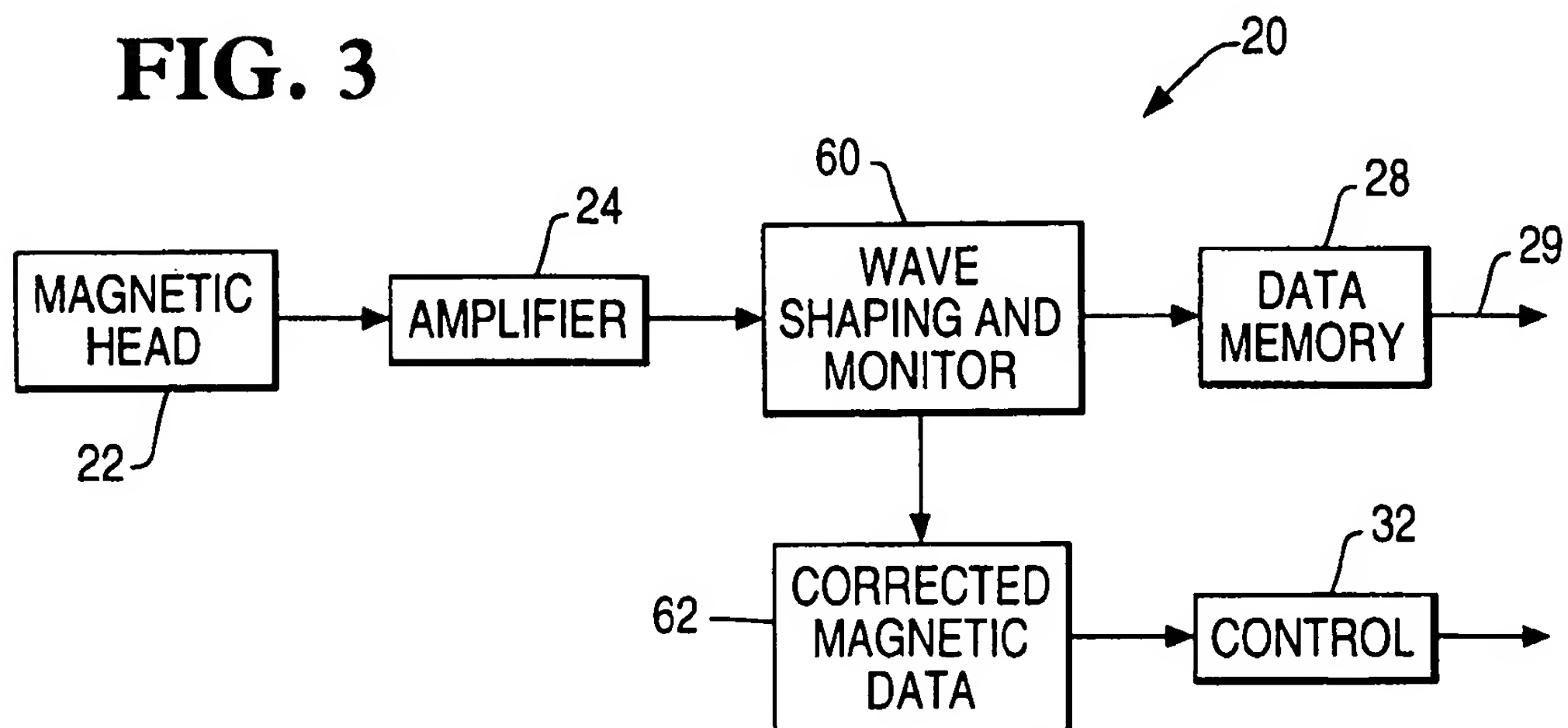
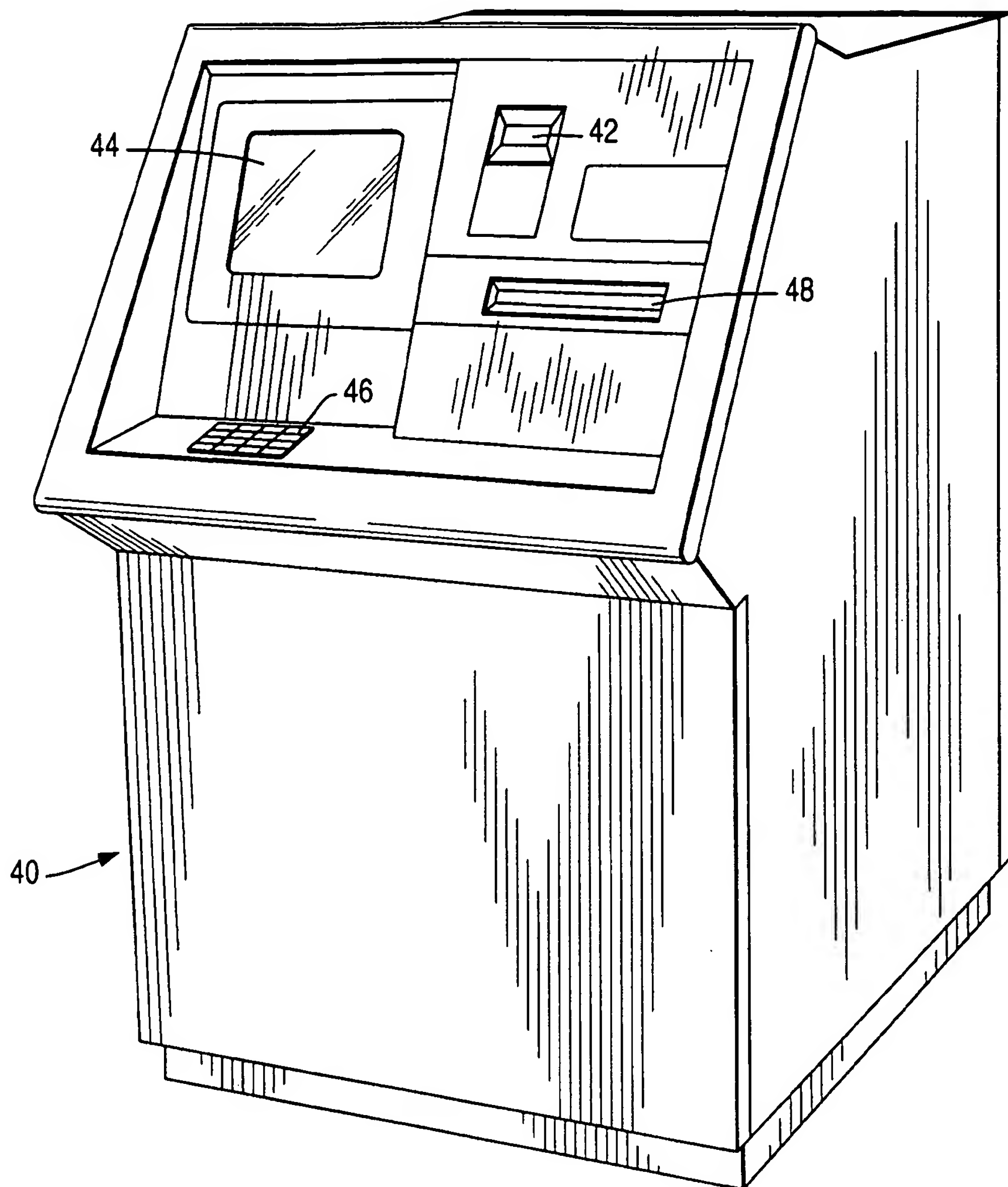
FIG. 1**FIG. 2****FIG. 3**

FIG. 4**FIG. 5**